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IS 12878 (Part 2) : 1989
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(Reaffirmed 2003)

Indian Standard

SPECIFICATION FOR 6·30 mm MAGNETIC TAPE CARTRIDGE USING GCR RECORDING AT 394 ftpmm

PART 2 STREAMING MODE

UDC 681·327·636

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

July 1990

Price Group 7

Indian Standard

SPECIFICATION FOR 6·30 mm MAGNETIC TAPE CARTRIDGE USING GCR RECORDING AT 394 ftpmm

PART 2 STREAMING MODE

NATIONAL FOREWORD

This Indian Standard, which is identical with ISO 8462/2 : 1986 'Information processing — Data interchange on 6·30 mm (0·25 in) magnetic tape cartridge using GCR recording at 394 ftpmm (10 000 ftpi), 39 cpmm (1 000 cpi) — Part 2 : Streaming mode', issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on 15 December 1989 on the recommendation of the Computers, Business Machines and Calculators Sectional Committee (LTD 24) and approval of Electronics and Telecommunication Division Council.

In the adopted standard certain terminology and conventions are, however not identical with those used in Indian Standards; attention is specially drawn to the following:

a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.

b) Comma (,) has been used as a decimal market while in Indian Standards the current practice is to use a point (.) as the decimal marker.

c) For the purpose of Indian Standard, metric dimensions shall be applicable.

CROSS REFERENCES

In this Indian Standard, the following international standards are referred to. Read in their respective places the following:

International Standard	*Indian Standard*	*Degree of Correspondence*
ISO 646 Information processing — ISO 7-bit coded character set for information interchange	IS 10315 : 1982 7-bit coded character set for information interchange	Technically equivalent
ISO 2022 Information processing — ISO 7-bit and 8-bit coded character sets — Code extension techniques	IS 12326 : 1987 7-bit and 8-bit coded character sets — Code extension techniques	Identical
ISO 4873 Information processing — ISO 8-bit coded character sets for information interchange	IS : 10401 : 1982 8-bit coded character set for information interchange	Technically equivalent
ISO 8462/1 Information processing — Data interchange on 6·30 mm (0·25 in) magnetic tape cartridge using GCR recording at 394 ftpmm (10 000 ftpi), 39 cpmm (1 000 cpi) — Part 1 : Mechanical, physical and magnetic properties	IS 12878 (Part 1) : 1989 Specification for 6·30 mm magnetic tape cartridge using GCR recording at 394 ftpmm — Part 1 Mechanical, physical and magnetic properties	Identical

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1 Scope and field of application

ISO 8462 specifies the characteristics of a tape cartridge loaded with magnetic tape 6,30 mm (0.25 in) wide intended for digital recording at physical recording densities of 252 ftpmm (6 400 ftpi) and 394 ftpmm (10 000 ftpi).

ISO 8462/1 specifies the mechanical, physical and magnetic properties of a 6,30 mm (0.25 in) wide magnetic tape cartridge and methods for testing the surface quality of the tape. It also specifies the environmental conditions under which the cartridge shall be tested and operated, and recommends conditions for storage.

This part of ISO 8462 specifies a recording method and a data format intended for use in the streaming mode of operation. Two alternative track formats are specified :

- a 4-track format, and
- a 9-track format.

ISO 8462/1 and ISO 8462/2 provide for the physical interchange of cartridges between data processing systems, and specify a data format. A labelling standard for tape cartridges used in the streaming mode is under study. The availability of such a labelling standard will provide for full data interchange between data processing systems.

NOTE — Numeric values in the SI and/or Imperial measurement system in this part of ISO 8462 may have been rounded off and therefore are consistent with, but not exactly equal to, each other. Either system may be used, but the two should be neither intermixed nor reconverted. The original design was made using the Imperial measurement system.

2 Conformance

A 6,30 mm (0.25 in) wide magnetic tape cartridge shall be in conformance with ISO 8462 if it meets either all mandatory requirements of both ISO 8462/1 and ISO 8462/2 specified for the 4-track format or all mandatory requirements of both ISO 8462/1 and ISO 8462/2 specified for the 9-track format. The two formats shall not exist on the same cartridge.

In addition the code used shall conform with one of the codes specified in the documents referenced in clause 3.

3 References

ISO 646, *Information processing — ISO 7-bit coded character set for information interchange.*

ISO 2022, *Information processing — ISO 7-bit and 8-bit coded character sets — Code extension techniques.*

ISO 4873, *Information processing — 8-bit coded character set for information interchange.*

ISO 8462/1, *Information processing — Data interchange on* 6,30 mm (0.25 in) *magnetic tape cartridge using GCR recording at* 394 ftpmm (10 000 ftpi), 39 cpmm (1 000 cpi) — *Part 1 : Mechanical, physical and magnetic properties.*

4 Hexadecimal notation

Hexadecimal notation is used hereafter to denote the following bytes :

(00) for (B8 to B1) = 0000 0000
(01) for (B8 to B1) = 0000 0001
(02) for (B8 to B1) = 0000 0010
(03) for (B8 to B1) = 0000 0011
(04) for (B8 to B1) = 0000 0100
(05) for (B8 to B1) = 0000 0101
(06) for (B8 to B1) = 0000 0110
(07) for (B8 to B1) = 0000 0111

5 Reference plane

The Reference Plane shall be the top of the base plate (plane B in ISO 8462/1).

The Reference Edge shall be that edge of the tape which is nearer to the top of the base plate.

The location of the centrelines of the tracks is referred to the Reference Plane.

6 Track geometry

6.1 Track location

The positions of the nine tracks are defined by specifying the distance of their centrelines from the Reference Plane (see figure 1).

6.2 Number of tracks

6.2.1 4-track format

In the 4-track format only tracks 0, 1, 2 and 3 are usable. Tracks are recorded sequentially from track 0 (see also 10.1).

6.2.2 9-track format

In the 9-track format all nine tracks are usable. Tracks are recorded sequentially from track 0 (see also 10.2).

6.3 Track width

The recorded track width shall be

- for a 4-track format : 0,914 ± 0,025 mm (0.036 ± 0.001 in);
- for a 9-track format : 0,343 ± 0,013 mm (0.013 5 ± 0.000 5 in).

7 Recording

7.1 Method of recording

The recording method shall be the "Non Return To Zero Mark" (NRZ1) method where a ONE is represented by a change of direction of longitudinal magnetization.

7.2 Physical recording densities

The maximum nominal physical recording density shall be 394 ftpmm. The nominal bit cell length shall be 2,54 µm.

Two other densities occur with the recording method described in this part of ISO 8462, namely :

197 ftpmm (5 000 ftpi)

131 ftpmm (3 333 ftpi)

7.3 Average bit cell length variations

7.3.1 Average bit cell length

The average bit cell length is the sum of the distances between the flux transitions in n bit cells divided by $(n-1)$. The tests below may be made in any continuously recorded pattern, provided that the first and the last bit cell each contain a flux transition.

7.3.2 Long-term average bit cell length

The long-term average bit cell length is the average bit cell length taken over at least 900 000 bit cells. The long-term average bit cell length shall be within ± 4 % of the nominal bit cell length.

7.3.3 Short-term average bit cell length

The short-term average bit cell length is the average bit cell length taken over 126 to 130 bit cells. The short-term average bit cell length shall be within ± 7 % of the long-term average bit cell length.

7.4 Flux transition spacing

In the following tests the results are expressed as the ratio of measurements; the effects of variations in long-term average bit-cell length and short-term average bit-cell length are thereby eliminated.

7.4.1 Instantaneous flux transition spacing

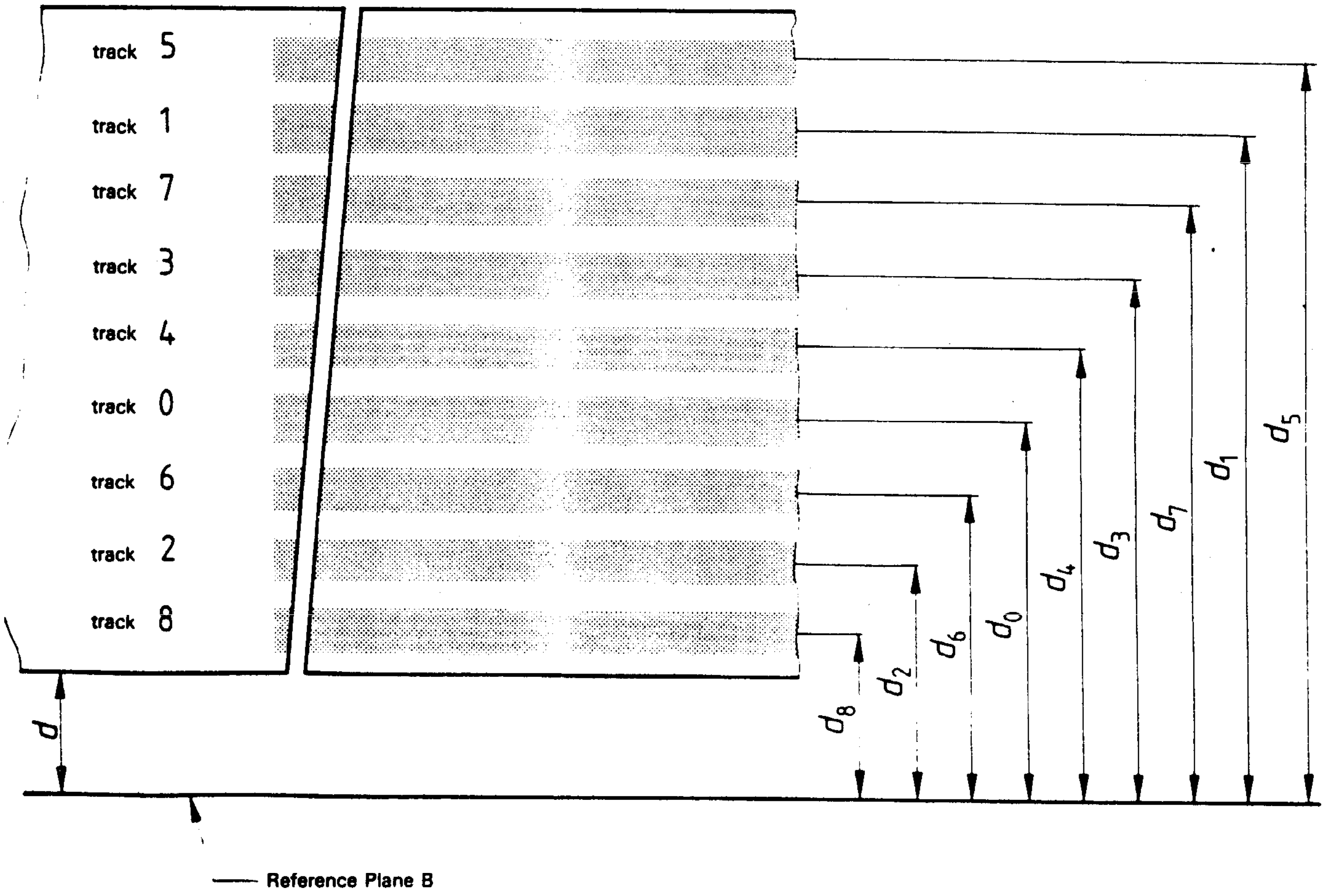
The instantaneous spacing between flux transitions is influenced by the reading and writing processes, the pattern recorded (pulse-crowding effect) and other factors.

Instantaneous spacings between flux transitions shall satisfy the following conditions (see figure 2).

In a sequence of flux transitions defined by the bit pattern 11100111, for example as occurs in the Block Marker (see 13.1.2), the centre flux transition of each group of three ONEs is called a Reference Flux Transition. The spacing between any pair of contiguous ONE flux transitions shall not deviate by more than 35 % from the bit cell length d_1 averaged over the five bit cells between reference flux transitions.

7.4.2 Rate of change of average flux transition spacing

In a sequence of flux transitions defined by the data pattern 10100101 the rate of change of the average flux transition spacing, averaged over four flux transition spacings, shall not exceed 0,002 6 per flux transition spacing, i.e. in the pattern shown in figure 3.



d = 1,773 mm (0.070 in) nominal

d_0 = 4,369 ± 0,107 mm (0.172 0 ± 0.004 2 in)

d_1 = 6,807 ± 0,107 mm (0.268 0 ± 0.004 2 in)

d_2 = 3,150 ± 0,107 mm (0.124 0 ± 0.004 2 in)

d_3 = 5,588 ± 0,107 mm (0.220 0 ± 0.004 2 in)

d_4 = 4,978 ± 0,107 mm (0.196 0 ± 0.004 2 in)

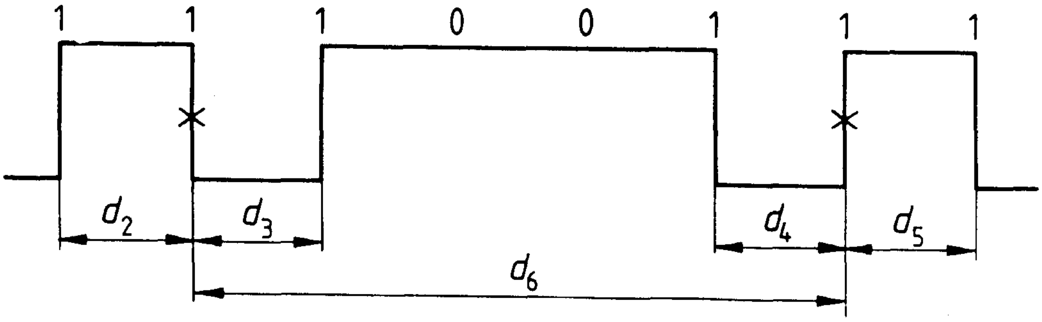
d_5 = 7,417 ± 0,107 mm (0.292 0 ± 0.004 2 in)

d_6 = 3,759 ± 0,107 mm (0.148 0 ± 0.004 2 in)

d_7 = 6,198 ± 0,107 mm (0.244 0 ± 0.004 2 in)

d_8 = 2,540 ± 0,107 mm (0.100 0 ± 0.004 2 in)

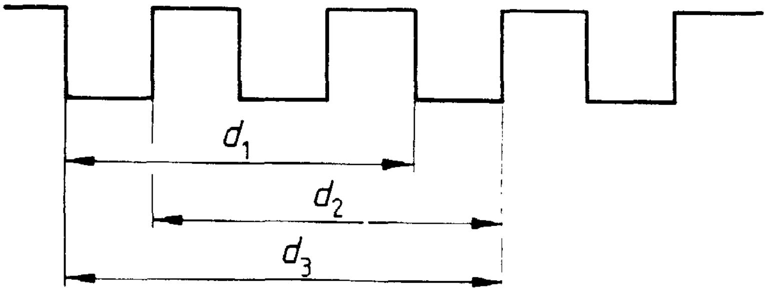
Figure 1



× denotes a reference flux transition

$1,35\,d_1 > d_2 > 0,65\,d_1$
$1,35\,d_1 > d_3 > 0,65\,d_1$
$1,35\,d_1 > d_4 > 0,65\,d_1$
$1,35\,d_1 > d_5 > 0,65\,d_1$
$d_1 = 0,20\,d_6$

Figure 2



$$\frac{\left|\frac{d_1}{4} - \frac{d_2}{4}\right|}{\frac{d_3}{5}} \leqslant 0{,}002\,6$$

Figure 3

7.5 Signal amplitude of a recorded cartridge for data interchange

For the 4-track format the width of the track read shall be 0,508 ± 0,025 mm (0.020 ± 0.001 in) and shall be within the recorded track.

For the 9-track format the track read shall extend over the whole width of the recorded track.

When performing the tests, the output or resultant signal shall be measured on the same pass for both the Standard Amplitude Reference Tape Cartridge and the tape under test (i.e. the read-whilst-write pass or the first forward-read pass) on the same equipment. The signal amplitude shall be measured at a point in the read chain at which the signal is proportional to the rate of change of the flux induced in the head.

After writing, the cartridge shall meet the following requirements.

7.5.1 Average signal amplitude at nominal maximum density

At the nominal maximum density of 394 ftpmm (10 000 ftpi) the average peak-to-peak signal amplitude of any track shall be within + 50 % and −35 % of SRA_{394} (see ISO 8462/1). This averaging shall be made over the central 100 flux transitions of any 120 contiguous flux transitions in a block and over at least 100 blocks.

7.5.2 Minimum signal amplitude

When interchanged, a tape shall not contain in the valid information area any flux transition the base-to-peak signal amplitude of which is less than 25 % of half of SRA_{394} (see ISO 8462/1).

7.5.3 Maximum signal amplitude

The peak-to-peak signal amplitude at 131 ftpmm (3 333 ftpi) shall be less than three times SRA_{394}.

8 Erasure

The tape shall be AC erased.

After erasure any remaining signal amplitudes at, or below, twice the frequency corresponding to the maximum physical recording density shall be less than 3 % of SRA_{394}.

9 Recording offset angle

On any track the angle that a flux transition across the track makes with a line perpendicular to Reference Plane B shall not exceed 9′ of arc.

10 Use of tracks

10.1 4-track format

10.1.1 Each track shall be a data track and shall be written serially.

10.1.2 Tracks shall be recorded in the numerical order of their track numbers, starting with track 0.

10.1.3 Tracks 0 and 2 shall be recorded in the direction from the BOT marker to the EOT marker. Tracks 1 and 3 shall be recorded in the direction from the EOT marker to the BOT marker.

10.1.4 On track 0 a Reference Burst recorded at the maximum nominal recording density of 394 ftpmm (10 000 ftpi) shall be written between the BOT marker and data recorded on track 0. This Reference Burst shall commence not more than 381 mm (15 in) from the BOT marker and extend for a minimum length of 76,2 mm (3 in) and a maximum length of 101,6 mm (4 in) beyond the LP marker.

10.1.5 On tracks 0 and 2 data shall commence not less than 76,2 mm (3 in) and not more than 101,6 mm (4 in) after the LP marker. No data for interchange shall be recorded beyond 914,4 mm (36 in) after the EW marker.

10.1.6 On tracks 1 and 3 data shall commence not less than 25,4 mm (1 in) and not more than 50,8 mm (2 in) after the EW marker.

On track 1 the last Data or File Mark Block written shall end not more than 101,6 mm (4 in) and not less than 2,54 mm (0.1 in) before the LP marker, measured from the centre of the hole.

If Control Blocks are used at the end of tracks [see 13.4.2 b)], they shall be recorded starting at least 2,54 mm (0.1 in) after the LP marker on track 1. A Long Preamble shall be recorded between the last Data or File Mark Block and the Control Block.

On track 3 the last block written shall end not more than 685,8 mm (27 in) after the LP marker.

10.2 9-track format

10.2.1 Each track shall be a data track and shall be written serially.

10.2.2 Tracks shall be recorded in the numerical order of their track numbers, starting with track 0.

10.2.3 Tracks 0, 2, 4, 6 and 8 shall be recorded in the direction from the BOT marker to the EOT marker. Tracks 1, 3, 5 and 7 shall be recorded in the direction from the EOT marker to the BOT marker.

10.2.4 On track 0 a Reference Burst recorded at the maximum nominal recording density of 394 ftpmm (10 000 ftpi) shall be written between the BOT marker and data recorded on track 0. This Reference Burst shall commence not more than 381 mm (15 in) from the BOT marker and extend for a minimum length of 76,2 mm (3 in) and a maximum length of 101,6 mm (4 in) beyond the LP marker.

10.2.5 On tracks 0, 2, 4, 6 and 8 data shall commence not less than 76,2 mm (3 in) and not more than 101,6 mm (4 in) after the LP marker. No data for interchange shall be recorded beyond 914,4 mm (36 in) after the EW marker.

10.2.6 On tracks 1, 3, 5 and 7 data shall commence not less than 25,4 mm (1 in) and not more than 50,8 mm (2 in) after the EW marker.

On tracks 1 and 7 the last Data or File Mark Block written shall end not more than 101,6 mm (4 in) and not less than 2,54 mm (0.1 in) before the LP marker, measured from the centre of the hole.

If Control Blocks are used at the end of tracks [see 13.4.2 b)], they shall be recorded starting at least 2,54 mm (0.1 in) after the LP marker on tracks 1 and 7. A Long Preamble shall be recorded between the last Data or File Mark Block and the control Block.

On tracks 3 and 5 the last block written shall end not more than 685,8 mm (27 in) after the LP marker.

10.3 Summary of requirements for use of tracks and Reference Burst

Figure 4 summarizes the requirements specified in 10.1 and 10.2.

11 Coded representation of the data

11.1 General

The information intended for data interchange shall be coded and interpreted according to the relevant standards for the coding of information.

11.2 Coding methods

11.2.1 When required by the coding method, the coded representations to be recorded in the Data Field of a Data Block shall be regarded as an ordered sequence of 8-bit bytes.

Within each byte the bit positions shall be identified by B8 to B1. The high-order bit shall be represented in position B8 and the low-order bit in position B1.

When the data is encoded according to an 8-bit code, the binary weights of the bit positions shall be as follows :

Bit position	B8	B7	B6	B5	B4	B3	B2	B1
Binary weight	128	64	32	16	8	4	2	1

Dimensions in millimetres

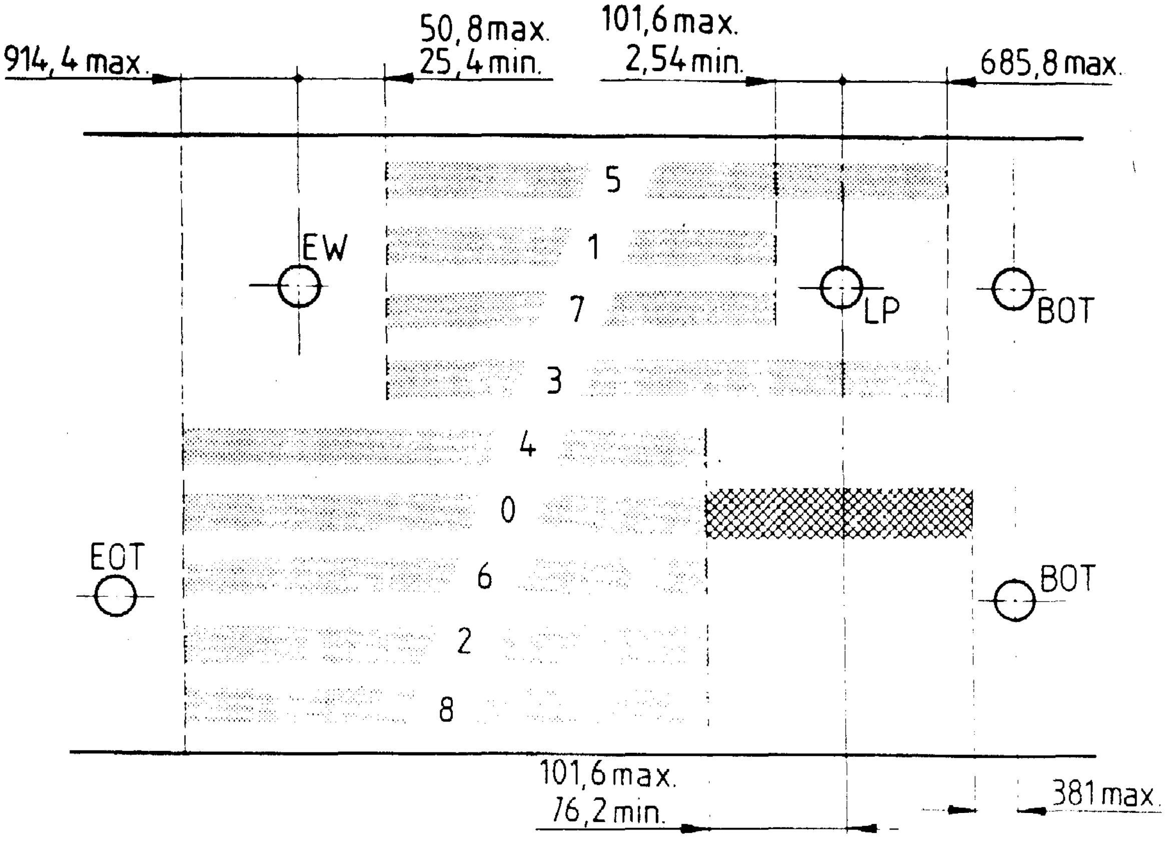


Figure 4

When the data is encoded according to a 7-bit code, bit position B8 shall contain bit ZERO, and the data shall be encoded in bit position B7 to B1, using the same binary weight as shown above.

11.2.2 When required by the coding method, the coded representations to be recorded in the Data Field of a Data Block shall be regarded as an ordered sequence of bit positions, each containing a bit.

For the purpose of this part of ISO 8462 the sequence of bits shall be regarded as an ordered sequence of 8-bit bytes. Within a byte successive bits of the coded representation shall be allocated to bit positions B8 to B1 in that order.

12 Recording of coded characters on the tape

Prior to recording on the tape, the coded representations (see clause 11) shall be transformed as described below, except for the following fields :

- Preamble (13.1.1);
- Block Marker (13.1.2);
- Postamble (13.1.6);
- The Data field of File Mark Blocks (13.2.1).

12.1 Each 8-bit byte shall be split into two groups of four consecutive bits, one group containing the four most significant bits (B8 to B5) and one group containing the four least significant bits (B4 to B1).

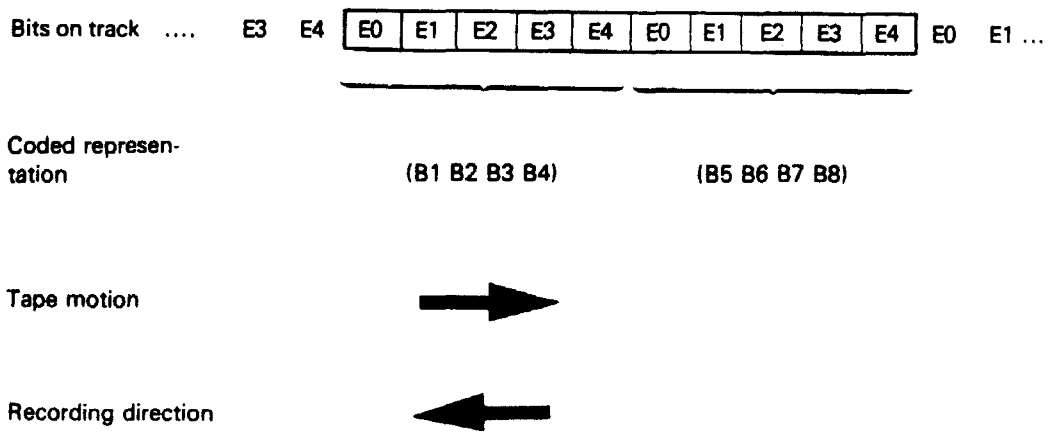
12.2 Each 4-bit group shall then be transformed into a 5-bit group in accordance with table 1.

Table 1

B8	B7	B6	B5					
B4	**B3**	**B2**	**B1**	**E4**	**E3**	**E2**	**E1**	**E0**
0	0	0	0	1	1	0	0	1
0	0	0	1	1	1	0	1	1
0	0	1	0	1	0	0	1	0
0	0	1	1	1	0	0	1	1
0	1	0	0	1	1	1	0	1
0	1	0	1	1	0	1	0	1
0	1	1	0	1	0	1	1	0
0	1	1	1	1	0	1	1	1
1	0	0	0	1	1	0	1	0
1	0	0	1	0	1	0	0	1
1	0	1	0	0	1	0	1	0
1	0	1	1	0	1	0	1	1
1	1	0	0	1	1	1	1	0
1	1	0	1	0	1	1	0	1
1	1	1	0	0	1	1	1	0
1	1	1	1	0	1	1	1	1

Thus each 8-bit byte shall be recorded as a 10-bit byte on the tape.

12.3 For each 8-bit byte of the coded representation the most significant 4-bit group is deemed to be recorded first. As a consequence the 5-bit group corresponding to B8 to B5 shall be recorded first starting with E4 and the 5-bit group corresponding to B4 to B1 shall follow.



13 Track format

Each track may contain Data Blocks and File Mark Blocks. Control Blocks may be present as described in 13.4.

13.1 Data Block

A Data Block shall comprise the following fields :

Data Block					
Preamble	Block Marker	Data	Block Address	CRC	Postamble

13.1.1 Preamble

This field shall contain ONE bits, i.e. flux transitions recorded at the maximum nominal recording density of 394 ftpmm.

The Preamble of the first block of each track shall contain not less than 15 000 and not more than 30 000 ONEs. It is called a Long Preamble.

The Preamble of each of the following blocks of a track shall contain not less than 120 and not more than 300 ONEs. It is called a Normal Preamble.

However, a block shall contain a Preamble of not less than 3 500 and not more than 7 000 ONEs if the preceding block has an Elongated Postamble (see 13.1.6). Its recording shall begin not less than 3 000 and not more than 3 500 ONEs from the second CRC byte (see 13.1.5) of the preceding block. Such a Preamble is called an Elongated Preamble.

If Control Blocks are used at the end of tracks [see 13.4.2 b)], an Elongated Preamble shall be recorded between the last Data or File Mark Block on all tracks except track 1 and track 7. On track 1 and track 7 a Long Preamble shall be recorded between the last Data or File Mark Block and the Control Block.

13.1.2 Block Marker

This field identifies the start of the data. It consists of a fixed bit pattern

1 1 1 1 1 0 0 1 1 1

13.1.3 Data

This field contains the data of the block. It comprises 512 bytes.

13.1.4 Block Address

The Block Address shall comprise four bytes forming the following fields :

Block Address			
Track number	Block type	Block number	
1st byte	2nd byte	3rd byte	4th byte

13.1.4.1 Track number

This byte shall specify the track number as follows :

(00) shall indicate track 0
(01) shall indicate track 1
(02) shall indicate track 2
(03) shall indicate track 3
(04) shall indicate track 4
(05) shall indicate track 5
(06) shall indicate track 6
(07) shall indicate track 7
(08) shall indicate track 8

13.1.4.2 Block Type

This 4-bit field shall indicate whether the block is a Data Block, a File Mark Block or a Control Block.

0000 shall mean that the block is a Data Block or a File Mark Block (see 13.2).

0001 shall mean that the block is a Control Block (see 13.3 and 13.4).

Other bit combinations are reserved for future standardization and shall not be used.

13.1.4.3 Block Number

This field comprises the 20 bits from the 5th bit of the 2nd byte to the last bit of the 4th byte. It specifies in binary notation the block number from 1 to 1 048 575 by giving the weights 524 288, 262 144, 131 072, 65 536, 32 768, ..., 64, 32, 16, 8, 4, 2, 1 to these 20 bits. The most significant bit is the 5th bit of the second byte, the least significant bit is the last bit of the 4th byte.

13.1.4.4 GCR handling of Block Address

When recording the tape in GCR mode, the four bits of the Block Type and the four most significant bits of the Block Number shall be considered as one 8-bit byte.

13.1.5 CRC (Cyclic Redundancy Check)

The 16 bits following the Block Address of a Data Block shall be a Cyclic Redundancy Check character. This 16-bit character shall be written in each block following the Block Address and immediately preceding the postamble, the most significant bit being recorded first (see 12.3). The polynomial generating the CRC shall be

$$G(x) = x^{16} + x^{12} + x^5 + 1$$

The CRC generation shall start with the most significant bit of the first data byte and end with the least significant bit of the Block Number field of the Block Address.

Prior to operation all positions of the shift-register shall be set to ONE.

13.1.6 Postamble

This field shall contain ONE bits, i.e. flux transitions recorded at the maximum nominal recording density of 394 ftpmm.

Each block shall be terminated by a Normal Postamble of not less than 5 and not more than 20 ONEs which is continuous with the Preamble of the next block.

If the drive is not ready to write the next block or if the block just written is a File Mark Block (see 13.2) an Elongated Postamble of not less than 3 500 and not more than 7 000 ONEs shall be written.

NOTE — This requirement, taken together with that in 13.1.1, ensures that there will be no gap in the sequence of ONEs between an Elongated Postamble and an Elongated Preamble; there may, however, be a phase shift.

13.2 File Mark Block

A File Mark Block shall be identical with a Data Block but for the following exceptions :

a) Its Data field shall contain a fixed pattern :

00101 00101

For the purpose of calculating the CRC, when reading the tape, this recorded 10-bit pattern shall be deemed to represent the 8-bit byte 1111 1111.

b) The Postamble of a File Mark Block shall always be an Elongated Postamble.

c) A File Mark Block may be recorded between blocks anywhere on the tape.

d) The last block of an interchange cartridge shall be a File Mark Block. It may be omitted if Data Blocks are recorded on track 3 beyond the LP marker in 4-track format or on track 8 beyond the EW marker in 9-track format.

13.3 Control Blocks

A Control Block shall be identical with a Data Block but for the following exceptions :

a) The bit pattern of the Block Type (see 13.1.4.2) shall be 0001.

b) The Data field shall be as follows :

1st byte

(04) shall mean that the cartridge is recorded in 4-track format;

(09) shall mean that the cartridge is recorded in 9-track format.

2nd byte

(00) shall mean that the Control Block is a Dummy Control Block [see 13.4.2 c)];

(01) shall mean that the Control Block is the 1st block of a track [see 13.4.1.1 and 13.4.2 a)];

(02) shall mean that the Control Block is the last block of a track [see 13.4.2 b)];

(03) shall mean that the next block is a File Mark Block [see 13.4.2 c)] and that its File Mark Number is specified by the 3rd and 4th bytes of this Control Block.

All other possible 252 bit combinations are reserved for future standardization and shall not be used.

3rd byte

When the 2nd byte is a (03) byte this byte specifies the most significant digits of the File Mark Number [see 13.4.2 c)] in binary notation by giving to its bits the weights :

32 768   16 384   8 192   4 096   2 048   1 024   512   256

When the 2nd byte is not a (03) byte, this byte shall be a (00) byte.

4th byte

When the 2nd byte is a (03) byte this byte specifies the least significant digits of the File Mark Number [see 13.4.2 c)] in binary notation by giving to its bits the weights :

128   64   32   16   8   4   2   1

When the 2nd byte is not a (03) byte, this byte shall be a (00) byte.

5th to 512th bytes

These bytes shall be set to (00).

13.4 Use of Control Blocks

The use of Control Blocks is optional. A tape containing Control Blocks as specified in 13.3 shall be acceptable for interchange. The recipient of the cartridge shall read the whole contents of each Control Block in order to check the CRC and to maintain the sequence of block numbers, but is permitted to ignore the Data Field.

If Control Blocks are included, the following rules shall apply.

13.4.1 Track 0

On track 0 the first block shall always be a Control Block. The bytes of its Data Field shall be set as follows :

1st byte : (04) or (09)
2nd byte : (01)
3rd to 512th byte : (00)

13.4.2 Further uses of Control Blocks

Control Blocks may be used in one or more of the following three cases :

a) A Control Block shall be written as the first block on each track.

b) A Control Block shall be written as the last block on each track, provided that the writing is continued on the following track. In this case, the contents of the 2nd byte in the Control Block depends upon whether the preceding (last) Data or File Mark Block was verified as good or bad.

If the last Data or File Mark Block was verified as good, the 2nd byte shall be set to (02).

If the last Data or File Mark Block was verified as bad, the 2nd byte shall be set to (00).

To allow time to verify the last Data Block, an Elongated Preamble shall be recorded prior to writing the Control Block, on all tracks except on track 1 and track 7.

On track 1 and track 7, a Long Preamble shall be recorded prior to writing the Control Block, in such a way that the Control Block Marker is located at least 2,54 mm (0.1 in) after the LP Marker.

c) A Control Block shall precede each File Mark Block. The 2nd byte in the Control Block shall be set to (03).

In this case File Mark Blocks are numbered from 0 to 65 535 by using the 3rd and 4th bytes of the Data Field in the Control Block as specified in 13.3.2. (This is in addition to their Block Number specified in 13.1.4.3.)

14 End of recorded data

The end of recorded data shall be indicated by a File Mark Block followed by at least 1 143 mm of erased track.

If the end of the permissible recording area of the track is reached before this distance is passed, the measurement shall be continued on the next track, unless this was the last track.

15 Re-writing operations

When recording the tape, some blocks may have to be re-written further down the tape. This is done to improve the system error rate. The decision criteria for the re-write operation are not a part of this part of ISO 8462, except as specified in 7.5.

15.1 Re-writing rules

15.1.1 A block *n* may be recognized as erroneous before or after block *n* + 1 has been partly or completely written but it shall always be so recognized before the writing of block *n* + 2 commences.

15.1.2 An erroneous block shall not be erased, it shall be rewritten further down the tape.

15.1.3 A correct block *n* shall be followed, not necessarily immediately, by a correct block *n* + 1.

15.1.4 An erroneous block shall not be re-written more than 16 times.

15.1.5 Re-written blocks shall retain their Block Number, in addition, if applicable, File Mark Blocks shall retain their File Mark Block Number.

Examples of resulting track layouts are given in the annex.

15.2 Rejection criterion

A magnetic tape cartridge intended for interchange shall be rejected if it contains at least one erroneous block recorded more than 17 times, whereby blocks numbered *n* + 1 encountered before the last repeat of block *n* shall be ignored in this count (blocks to be ignored are shaded in the example shown in the annex).

16 Updating operations

Each track is normally recorded continuously starting from the beginning of the track. If it is necessary to start a write operation in the middle of a track, the write current shall be turned on after the write head has passed at least 3 000 flux transitions of the Postamble of the last block, but before the end of the Postamble.

17 Reading operations

When reading a tape conforming to this part of ISO 8462, if a block is not correctly read it should be discarded and reading should continue immediately with the next block.

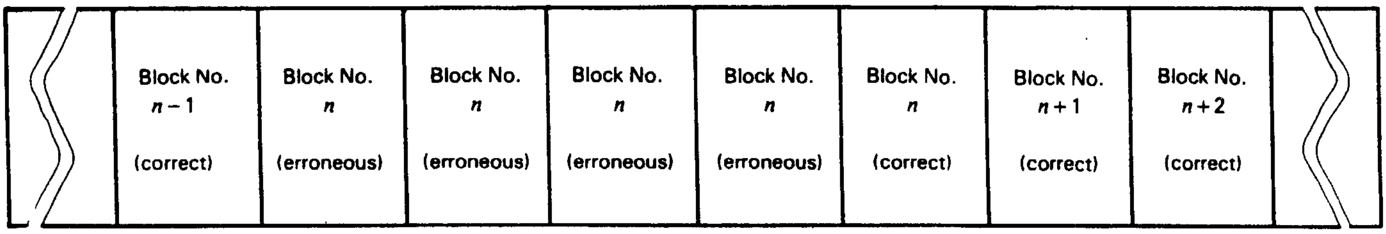
Blocks which were regarded as incorrect when written may be read correctly: the reading process shall, therefore, use the block numbers to ensure that blocks are not read out of sequence.

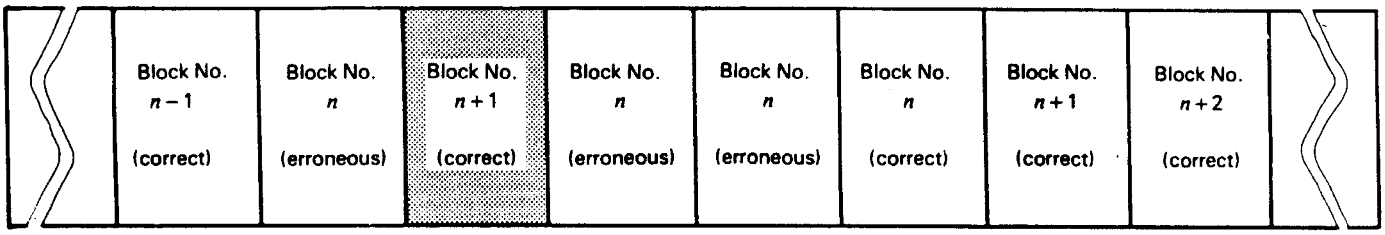
When block $n-1$ has been correctly read, succeeding blocks with any number other than *n* should be discarded until a block numbered *n* has been correctly read. If block $n+2$ is encountered before *n* is correctly read, a read error has occurred and block *n* cannot be recovered.

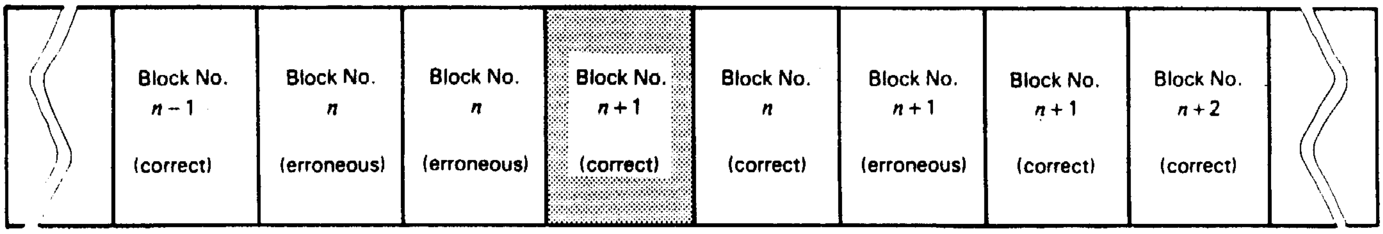
Annex

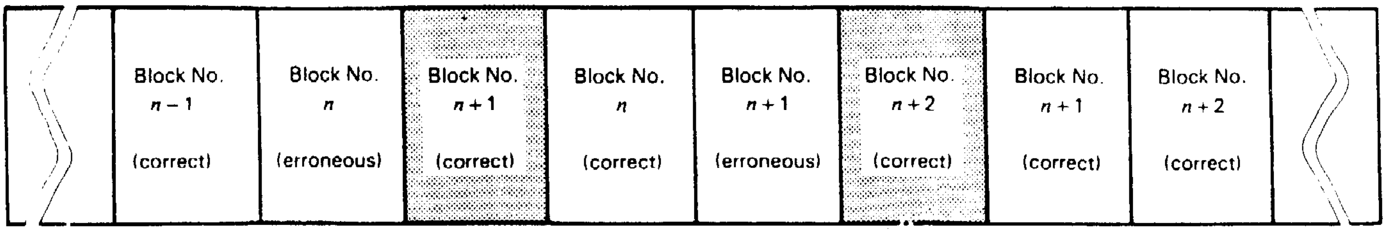
Example of writing operations

(This annex does not form part of the standard.)




Block No. n − 1 (correct)
Block No. n (erroneous)
Block No. n + 1 (correct)
Block No. n (erroneous)
Block No. n (erroneous)
Block No. n (correct)
Block No. n + 1 (correct)
Block No. n + 2 (correct)


Block No. n − 1 (correct)
Block No. n (erroneous)
Block No. n (erroneous)
Block No. n + 1 (correct)
Block No. n (correct)
Block No. n + 1 (erroneous)
Block No. n + 1 (correct)
Block No. n + 2 (correct)


Block No. n − 1 (correct)
Block No. n (erroneous)
Block No. n + 1 (correct)
Block No. n (correct)
Block No. n + 1 (erroneous)
Block No. n + 2 (correct)
Block No. n + 1 (correct)
Block No. n + 2 (correct)

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